

CLAIMS

1. (Currently Amended) An array speaker apparatus ~~in which sounds radiated with directivities from a plurality of speaker units in accordance with an audio signal are reflected by wall surfaces so as to generate a virtual sound source~~, comprising:

a plurality of speaker units arranged in an array;

a first radiation control means for driving unit that drives the speaker units with first driving signals so that sounds corresponding to a first audio signal of each main channel are radiated to the wall surfaces on the left and right sides of a listening position; and

a second radiation control means for driving unit that drives the speaker units with second driving signals so that sounds corresponding to a second audio signal the same as the first audio signal are radiated directly to the listening position; and

first and second delay circuits that selectively add predetermined delays in the first and second driving signals respectively to control the directivity of the first and second audio signals;

wherein a virtual sound source is created between the array speaker apparatus and the wall surface.

2. (Original) The array speaker apparatus according to Claim 1, comprising means for correcting one or both of a frequency-gain characteristic and a frequency-phase characteristic of at least the first audio signal out of the first audio signal and the second audio signal so that sounds arriving at the listening position have desired properties.

3. (Currently Amended) An array speaker apparatus ~~in which sounds radiated with directivities from a plurality of speaker units in accordance with an audio signal are reflected by wall surfaces so as to generate a virtual sound source~~, comprising:

a high pass filter for extracting a first audio signal of a middle/high frequency band from an input audio signal of each surround channel;

a low pass filter for extracting a second audio signal of a low frequency band from the input audio signal;

a plurality of speaker units arranged in an array;

a first radiation control unit that drives means for driving the speaker units with first driving signals so that sounds corresponding to the first audio signal are reflected by ~~the a~~ wall surface behind a listening position and then reach prior to reaching the listening position; and

a second radiation control unit that drives means for driving the speaker units with second driving signals so that a sound pressure level of sounds corresponding to the second

audio signal reaching the listening position is smaller than a sound pressure level of sounds corresponding to the first audio signal reaching the listening position; and

first and second delay circuits that selectively add predetermined delays in the first and second driving signals respectively to control the directivity of the first and second audio signals;
wherein a virtual sound source is created between the array speaker apparatus and the wall surface.

4. (Currently Amended) The array speaker apparatus according to Claim 3, wherein[[::]], assuming that a spatial point where sounds radiated from the plurality of speaker units arrive simultaneously is regarded as a focus, the first radiation control ~~means~~ unit and the second radiation control ~~means~~ unit drive the speaker units so that a focus of sounds corresponding to the second audio signal is set to be farther than a focus of sounds corresponding to the first audio signal.

5. (Currently Amended) The array speaker apparatus according to Claim 3, wherein[[::]]the first radiation control ~~means~~ unit and the second radiation control ~~means~~ unit drive the speaker units so that an angle between a radiation direction of sounds corresponding to the second audio signal and a frontal direction of the array speaker apparatus is larger than an angle between a radiation direction of sounds corresponding to the first audio signal and the frontal direction.

6. (Currently Amended) An array speaker apparatus ~~with a plurality of speaker units~~, comprising:

a plurality of speaker units arranged in an array;

a first audio signal generating circuit that generates first audio signals based on an input audio signal;

a second audio signal generating circuit that generates second audio signals based on the input signal;

adders that add the first audio signals to the second audio signals and input addition results to the plurality of speaker units; and

a directivity control unit that controls directivities of first output sounds output by the plurality of speaker units based on the first audio signals, and directivities of second output sounds output by the plurality of speaker units based on the second audio signals;

wherein the first audio signal generating circuit and the second audio signal generating circuit include delay circuits for delaying input signals, respectively; and

wherein the directivity control unit controls the delay circuits so as to realize the directivities of the first output sounds and the directivities of the second output sounds.

7. Cancelled

8. (Currently Amended) The array speaker apparatus according to Claim [[7]]6, wherein the first audio signal generating circuit and the second audio signal generating circuit further include characteristic correction circuits for performing desired characteristic correction upon the input signals, respectively.

9. (Original) The array speaker apparatus according to Claim 8, wherein the characteristic correction circuit of the first audio signal generating circuit includes a high pass filter, and the characteristic correction circuit of the second audio signal generating circuit includes a low pass filter.

10. (Original) The array speaker apparatus according to Claim 9, wherein the first audio signal generating circuit and the second audio signal generating circuit include multipliers for adjusting signals delayed by the delay circuits into desired levels, respectively.

11. (Currently Amended) The array speaker apparatus according to Claim 10, wherein[[::]] the multipliers are provided for the speaker units, respectively; and wherein a gain coefficient of at least one of the multipliers of the first audio signal generating circuit is zero.

12. (Currently Amended) An array speaker apparatus with a plurality of speaker units, comprising:

a plurality of speaker units arranged in an array;

a delay circuit that delays an input signal by a plurality of delay times set for the plurality of speaker units respectively;

a directivity control unit that controls the delay times of the delay circuit so as to determine directivities of output sounds output by the plurality of speaker units; and

filters that are provided for the speaker units respectively, and filter outputs of the delay circuit and output the filtered outputs to the speaker units;
wherein cut-off frequencies of the filters are different from one another.

13. (Original) The array speaker apparatus according to Claim 12, wherein each of the cut-off frequencies of the filters is set to be lower as a speaker unit corresponding thereto is located at a larger distance from a center of the array speaker.

14. (New) The array speaker apparatus according to claim 1, wherein the virtual sound source is located diagonally front with respect to the listener.

15. (New) The array speaker apparatus according to claim 3, wherein the virtual sound source is located diagonally backward with respect to the listener.